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CHARACTERIZATION AND EVALUATION OF THE SCIENCE
BOOKS COLLECTION OF THE FACULTÉ SAINT-JEAN LIBRARY,
UNIVERSITY OF ALBERTA, 1988

BY

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A RESEARCH PROJECT
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ABSTRACT

The undersigned certify that they have read, and recommend to the Faculty of Library Science for acceptance, a research project entitled "Characterization and evaluation of the science books collection of the Faculté Saint-Jean Library, University of Alberta, 1988" submitted by Guy Michaud in partial fulfilment of the requirements for the degree of Master of Library Science.



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ABSTRACT

This study is concerned with the science collection of the Faculté Saint-Jean Library, a unit of the University of Alberta Library System. The Faculté Saint-Jean Library's general collection is organized according to the Library of Congress classification scheme, and the section Q of this collection is the subject of this analysis. The science collection is characterized in terms of size, age, language and use (circulation). The analyses performed on the science collection are broken down by disciplines or subcollections which correspond to the LC alpha code. The evaluation aspect is limited mainly to a determination of the existing distortions between subcollections. The major results found through this study can be summarized as follows. The science collection, is relatively small, and shows a very low rate of growth in 1987-1988. Moreover, it is obsolete showing a mean age of 32,2 years with 66% of titles more than 20 years old. The age means range between 24 years in Natural History and over 47 years in Astronomy. Also, the analyses show a similarity of age distributions in Mathematics, Physics, Biology and Geology on the one hand, and in Astronomy and General Science on the other hand. The Chemistry subcollection is the most obsolete with 74% of its books older than 20 years. The use of the science collection is extremely low with an average of 0,75 circulations per title over the period 1978-1987. More than 70% of the titles never circulated during this period.

There are variations among subcollections: the circulation means range from 0,3 in General Science to 1,5 in Zoology. There is a relationship between age and circulation of books as well. The titles which circulated at least once are significantly younger than books which had not circulated during the same period. The science collection is still dominated by English literature though the francization of the collection is indicated by the fact that the French titles are newer than English titles in most of the disciplines taught at the Faculty. In general, French titles circulate more than English titles in the science collection, although the reverse trend is observed in some disciplines. Overall, the collection is believed to be very weak, and a strong program of development should be undertaken to make it more supportive for its growing clientele.

RÉSUMÉ

Ce travail s'intéresse à la collection de livres de science de la bibliothèque de la Faculté Saint-Jean qui est une composante du réseau de bibliothèques de l'Université de l'Alberta. La collection générale de cette bibliothèque est organisée selon le système de classification du Library of Congress et seule la division Q de la collection fait l'objet de cette analyse. La collection de science est décrite en terme de taille, d'âge, de langue et d'utilisation (prêt). Les analyses ont été effectuées sur l'ensemble de la collection mais aussi sur chacune de ses subdivisions qui correspondent aux codes alpha du système de classification sus-mentionné. Par ailleurs l'évaluation demeure limitée et consiste surtout à révéler, sur la base des variables mesurées, les distortions qui existent entre les diverses sections de la collection. Les principales observations résultant de cette étude pourrait se résumer comme suit. La collection de livres de science est relativement petite et a connu un taux de croissance très faible en 1987-1988. De plus, la collection est désuète, alors que l'âge moyen des livres est de 32,2 ans et que 66% des livres ont été publiés il y a plus de 20 ans. L'âge moyen varie selon les disciplines et se situe entre 24 ans en physique, et plus de 47 ans en astronomie. De plus les analyses ont révélées que les distributions de fréquence d'âge sont similaires en mathématique, physique, biologie et géologie d'une part, et en astronomie et science générale d'autre part. Par ailleurs, la subdivision de chimie se distingue des autres alors que 74% des livres ont plus de vingt ans. L'utilisation des livres de science est

très faible alors qu'une moyenne de 0,75 prêt par livre a été observée pour la période 1978-1987. Plus de 70% des livres n'ont pas été empruntés une seule fois durant cette période de 10 ans. Cependant, il y a des variations selon les disciplines alors que le nombre moyen de prêts se situe entre 0,3 en science générale et 1,5 en zoologie. Une relation entre l'âge et le nombre de prêts a également été observée. Les livres qui ont été empruntés au moins une fois durant la période spécifiée sont significativement plus récents que ceux qui n'ont pas été empruntés au cours de cette même période. D'autre part la collection de science contient plus de documents publiés en anglais qu'en français. Cependant la francisation de la collection se confirme alors que les livres français sont plus récents que les livres anglais dans la plupart des sciences qui sont enseignées à la Faculté Saint-Jean. De plus les livres français sont empruntés plus souvent que ceux écrits en anglais, bien qu'une tendance inverse soit notée pour certaines disciplines. De façon générale, la collection de livres de science semble déficiente à plusieurs égards et un programme d'amélioration de la collection devrait être amorcé au plus tôt afin d'accroître son utilité pour les usagers potentiels qui augmentent en nombre.

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I. INTRODUCTION

A. The Faculté Saint-Jean and its Library

The St. John's Juniorate was founded at Pincher Creek in 1908 and moved to its current site in Edmonton in 1911. This institution, which became Collège Saint-Jean in 1943, affiliated first with the University of Ottawa, and later with the Université Laval, to offer various post-secondary programs. During the 1960's, the college affiliated with the University of Alberta to offer both Education and Arts programs. In 1970, the college became Collège Universitaire Saint-Jean, an integral part and a bilingual sector of the University of Alberta. In 1977, the college was granted its official faculty status, and the name was then changed to Faculté Saint-Jean (University of Alberta, 1982; University of Alberta, 1988).

Currently the Faculté Saint-Jean (**FSJ**) offers the following degree programs: Bachelor of Arts (BA), Bachelor of Education (BEd), and Bachelor of Science (BSc). In spite of its faculty status in the University of Alberta, the **FSJ** differs from other faculties. First, although the Faculté is bilingual and French is the primary language of instruction, some courses are still offered in English only. Second, this young faculty does not yet offer graduate programs, and therefore it is more typical of a community college in terms of conventional library standards. This is important because library standards may differ considerably among postsecondary institutions (e.g. Clapp and Jordan, 1965). Finally, it is appropriate to note that **FSJ** is located about six kilometres east of the main campus.

Little is published about the history of the **FSJ** Library, and there are likely no publications describing the evolution of the collection or services. Since its integration into the University of Alberta Library System, considerable efforts have been made to weed the collection, re-organize it, and set up the current facilities. Presently, the total holdings of the **FSJ** Library is estimated to be more than 100,000 items (Henley, 1988), which accounts for a small fraction of the University of Alberta Library's total collection of several million items. Moreover, several **FSJ** Library services are not automated yet, notably the catalogue, which is on cards and microfiche, and the circulation system. Indeed, even though the **FSJ** Library is now an integral part of the University of Alberta Library System, its collection is not accessible through the DOBIS online catalogue. This is mainly due to the fact that items included in the **FSJ** Library collection are catalogued in French, and their inclusion into the file could confuse end-users. For instance, authorities which are assigned in French may differ from those assigned in English and so could cause an imbroglio in the *see* references. However, solutions are being sought to include the **FSJ** Library cataloguing into the DOBIS online catalogue.

B. Evaluation of the Science Collection

The objective of this work is twofold: firstly, it attempts to provide a description and an evaluation of the existing science book collection which could be useful for its further development and improvement; secondly, it provides an analysis of its relative usefulness, where the circulation of materials reflects such characteristics.

To quote Mosher (1984, p. 211), "Collection evaluation may be defined as assessment of the utility and appropriateness of a library's collections to its users or programs." Evans (1979) stated that an evaluation involves an implicit or an explicit comparison between an observed value "X" and a known value "Y". Certainly, one of the major problems faced in collection evaluation is to determine against which known values or standards an observed value could be compared.

Actually, there are some options which are well documented, and commonly used by librarians. A first approach would consist in comparing observed features of a collection against a written collection development policy which should include quantitative and qualitative statements based on the library's goals and objectives. Feng (1979) and Reed-Scott (1984) pointed out the importance of writing a collection development policy in order to define clearly the acquisition priorities. Such a document might serve as a reference point allowing comparisons between the desired collection and the actual collection. However, this method cannot be used in this study because the **FSJ** Library does not have such a yardstick document.

A second approach is to use standards and formulae derived from authoritative studies. Such standards serve as evaluation criteria for judging the adequacy of collections, notably in terms of size. However, the degree of arbitrariness involved in the establishment of such standards and formulae make their validity debatable. For this reason, and some others exposed further in this work, this method was not used in the present project to evaluate the **FSJ** Library's science collection.

A third way, which the author believed the most acceptable approach to evaluate a collection, consists of conducting analyses of a collection on a regular basis, and then comparing the relative changes over time to stated objectives. Unfortunately, there are no previous studies of the **FSJ** Library's collection that could serve as a benchmark, therefore this method was not applicable.

The general approach finally chosen for evaluating this science collection consists of comparing the characteristics measured for each subcollection or scientific discipline, each against the other. This method allows determination of the relative strengths and weaknesses of the science collection, and should enable the **FSJ** Library to set up priorities for further development.

In this study, three complementary approaches were used to describe the science collection in terms of size, nature, and usefulness. Several authors have reviewed the methods developed and used to evaluate collections (Bonn, 1974; Lancaster, 1977; Mosher, 1984). Even though each of these authors used different nomenclatures to classify those methods, essentially, they are all the same.

The first method used was to estimate the size of the science collection and determine its relative importance to the whole collection, and then, to assess the holdings of subcollections which correspond to scientific disciplines.

The second approach was to describe more accurately the nature of the science collection in terms of age, language, and extent of duplication. This method used by Goldstein and Sedransk (1977), and Burr (1979), is

called, "Analysis by collection characteristics" by Mosher (1984, p. 219). It is especially useful in analysing the adequacy of collections in terms of currentness and usefulness with respect to clients' needs.

The third method was a use study of the collection, namely the number of circulations of items over a 10-year period. This characteristic is an indicator of the usefulness of the collection to its patrons. To complete this evaluation, ideally, a fourth method should be added: the establishment of relationships between the Library of Congress classification and the curriculum offered at the **FSJ**. As mentioned by Mosher (1984), this method attempts to develop a correspondence between the LC classification scheme and the curriculum as set forth in the university calendar. However, such relationships are established laboriously and require extensive knowledge on the part of the librarian. Consequently, this time consuming procedure, which could be the subject of a work in itself, goes beyond the limited resources available for the present study.

II. METHODOLOGY

A. The Science Collection

The collection of the **FSJ** Library is classified according to the Library of Congress classification scheme. The scientific literature, which is the subject of this study, is classified in the Q section of the collection. Though it has been demonstrated by McGrath (1969) that scientific materials can be classified under other subject codes, it is assumed that the Q section contains most of the scientific literature held by the **FSJ** Library, and is representative of other science titles scattered throughout the general collection.

The units studied for this work, are the books of the general collection which is readily accessible to the clientele. A book could be defined as a non-periodical printed publication (Prytherch, 1987), whatever the number of pages. Moreover, throughout this work the terms book and title are non differentiated.

The science collection was analysed as a whole, and also, in a more detailed way, by disciplines and subdisciplines, also called subcollections (see Table 1). Moreover, for selected analyses, biological topics which are classified by subdisciplines under the LC codes QH to QR, were merged to form a subcollection described as "Biology". This procedure was used to create a topical class comparable with other broad scientific classes such as Mathematics, Physics and Geology.

Table 1. Library of Congress subdivisions of the science collection.

LC Code	Disciplines or Subdisciplines (=Subcollections)		Collection
Q	GENERAL SCIENCE		SCIENCE COLLECTION (Q-QR)
QA	MATHEMATICS		
QB	ASTRONOMY		
QC	PHYSICS		
QD	CHEMISTRY		
QE	GEOLOGY		
<hr/>			
QH	NATURAL HISTORY	BIOLOGY (QH-QR)	
QK	BOTANY		
QL	ZOOLOGY		
QM	HUMAN ANATOMY		
QP	PHYSIOLOGY		
QR	MICROBIOLOGY		

B. Estimation of the Science Collection Size

An estimation of the size of the science collection broken down by disciplines was done using the shelflist. Essentially, the procedure consisted of converting catalogue cards measured in centimeters into estimated number of titles. To do so, ten samples of 2,5 centimeters were taken randomly throughout the Q section of the shelflist. A vernier graduated in tenth of millimeters was used, and an effort was made to pack cards with the same pressure from one sample to another. By this method, an average number of titles by unit of measurement was obtained, and served to estimate the size of the science collection broken down by subcollections. This procedure is frequently reported in the literature with little variations (e.g. Goldstein and Sedransk, 1977; Burr, 1979; Black, 1981).

C. Size of Samples

The estimation of subcollection holdings is prerequisite to the determination of sample sizes. Once the former values were estimated, the units required per subcollection sample were obtained from a table provided by Schlachter (1983) for a confidence level of 95% and a permissible error range of 5 percent. This level of accuracy is acceptable for the needs of this study. The sample sizes for each subcollection are summarized in Table 2.

D. Sampling Technique

A single random sampling technique was used for the selection of titles from which data would be collected. According to Scherrer (1984) this technique is the only one that provides a sample truly representative of the population. In this specific case, this means a sample which accurately reflects the characteristics of the book collection being studied. Moreover, Sokal and Rohlf (1981) pointed out that an adequate random sampling is an essential requirement for all analyses of variance, which are the statistical tests used through this study.

Titles were selected using a random numbers table. The titles were counted in order of occurrence in the shelflist, and those titles corresponding to the numbers selected randomly were included in the sample. A title catalogued on several cards was counted only once. Moreover, cards representing serial titles were not included.

Table 2. Size of the science collection, and sample sizes required by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Collection Size* Number of Titles	Sample Size**
Q	General Science	215	162
QA	Mathematics	566	306
QB	Astronomy	75	75
QC	Physics	421	260
QD	Chemistry	372	253
QE	Geology	141	116
<hr/>			
QH	Natural History	253	139
QK	Botany	84	49
QL	Zoology	153	72
QM	Human Anatomy	2	2
QP	Physiology	101	57
QR	Microbiology	7	7
<hr/>			
QH-QR	Biology	600	326
<hr/>			
Q-QR	Science Collection	2390***	1498

* Estimated from the shelflist measurement (2,5 cm = 84 titles)

** For a level of confidence = 95 %, and a permissible error = 0,05.

*** The collection size in terms of volumes is estimated at 2835 volumes.

E. Collection of Data

For each of the 1498 titles selected, data were obtained from two complementary sources: the shelflist cards, and the books themselves. For each title, the following variables were recorded on a coding sheet:

- . Library of Congress classification alpha code
- . Library of Congress classification numeric code
- . Date of publication
- . Number of circulations between 1978 and 1987
- . Language of publication
- . Number of volumes and copies.

Each of these variables is described more extensively below.

1. Library of Congress Classification Alpha Code

As seen earlier, the LC classification alpha code is composed of either one or two letters which correspond to a scientific subject. This code was used as an identification variable which enabled the file to be divided into subcollections. This variable was particularly useful for analysing the variations of the characteristics measured by subcollections.

2. Library of Congress Classification Numeric Code

The LC classification numeric code is a more specific subject identifier that makes it possible to distinguish titles within an LC alpha code. Though not used in the present study, this information could be very useful, in a further study, to establish relationships between subjects included in the science curriculum and the library holdings.

3. Date of Publication

The date of publication was used to estimate the currency of the book collection and subcollections. The date of publication was taken from any part of the book itself, or from the shelflist card if the book was not available. For a title published in multiple volumes, a mean year of publication was calculated from all volumes, rounded to the nearest whole.

Since the concern of the study was the age of the content, the latest date of copyright was always chosen if more than one publication date was imprinted. In addition, if a doubt existed regarding the relationship between a date of copyright and the content of a new edition, introductory

parts were examined in order to find a statement of change from previous edition(s). If, however, no change was clearly identifiable, the second latest date of copyright was selected. Finally, if a date of publication was not provided, a blank was left, and no more attempt was made to determine the date of publication of a given title.

The age of each book's content, which is assumed to correspond to the latest update, has been derived from the date of publication. Thus, for each title the age of content was obtained by subtracting the year of publication from 1987, the year preceding the present study. As a consequence, books printed in 1987 were assigned a zero, a value which corresponds in fact to less than one year.

4. Number of Circulations Between 1978 and 1987

The number of circulations of each title was counted in order to obtain a figure, though admittedly incomplete, of the use of the science collection. This was accomplished by counting the number of stamps appearing on the date due slip. The counting was limited to the number of time a book had been borrowed over the 1978-1987 period. Actually, this period corresponds to the age of the Faculté Saint-Jean which was granted its faculty status in September 1977 (University of Alberta, 1988).

This method of evaluating the use of the science collection has some limitations. A major limitation frequently mentioned in the literature is that circulation reveals only a partial figure of the true rate of use of a collection. Indeed, it is generally agreed that any study of collection use should include the use of materials within the library as well. However,

the physical facilities of the **FSJ** Library do not favour in-library use of materials. For example, there are no tables or chairs within the stack area which is physically separated from the reading room by the microform room. Moreover, only 22 student stations are available within the library. There should be 125 stations for the 500 FTE students enrolled at the **FSJ** (Advance Planning Research for Architecture, 1984; Michaud, 1987). In addition, the 22 stations available are confined within a 20 m² area which is much less than the 2,3 m² per station recommended in the standard guidelines for the University of Alberta Library (APRA, 1984). In conclusion, all the above factors impede the in-library use of books at the **FSJ** Library, and should favour circulation of books. Therefore, it is believed that the measurement of circulation provides a realistic figure of the rate of use of the science collection.

Another bias, although less important, is related to the books on reserve. In the present study, those titles were included in the sampling, and all data for them were collected except for the number of circulations. As a matter of fact, those books are subject to a special regulation regarding their circulation, and as a consequence, they are assumed to behave differently from the rest of the collection. In addition, they represent only a minuscule fraction of the total sample and consequently their omission in the circulation statistics should not significantly affect the results.

The interpretation of circulation data is also limited by a missing piece of information. At the time of undertaking this study, the accession date of the book was not available. Therefore, it was not possible to normalize over time the rate of use of a book since it was placed on the

shelf. Instead, the value calculated is an average number of circulations over a 10-year period which represents a rough measure of collection use. Although this way of measuring use does not allow comparisons with other libraries, it nevertheless allows comparisons of the relative use over time of each section of the **FSJ** Library science collection.

5. Language of Publication

For each title sampled, the written language of publication was noted. Three categories were identified: English, French, and bilingual (French and English). There are no foreign language books in the science collection. This independent variable was analysed as a function of age and circulation.

6. Number of Volumes and Copies

The number of separate parts of multi-volume publications with the same LC call number were noted. As well, the number of copies of a given edition of a title were counted in order to determine the extent of duplication of books in the science collection. A ratio of titles to volumes derived from these data, provided an estimate of the size of the science collection in terms of total volumes held.

F. Statistical Analyses

1. Creation of the File and Generalities

The data for each title were entered into a computer file created on MTS (the operating system of the University of Alberta's Amdahl compu-

ter). When a data element was missing for a given title, the field was left blank. For all the statistical analyses performed, blanks were not considered as a value for the calculations. For instance, an item for which the date of publication was missing was not included in calculations of statistics for this variable, but could be included in an analysis of the number of circulations if this datum was available. Therefore, for a given subcollection, sample sizes (n value) provided are not consistent among variables. Finally, unless stated otherwise, all statistical analyses were computed with the Statistical Package for the Social Sciences (SPSSx), a program available on MTS. For all the analyses described, the usual estimators of population statistics have been calculated including the mean (\bar{X}), the standard error (SE) and the standard deviation (SD). Moreover, since none of the variables meet the basic criteria for the use of parametric tests (Sokal and Rohlf, 1981), only nonparametric tests were performed.

2. Age of Content

A Kruskal-Wallis test was used in order to determine whether the age distribution of books was homogeneous among subcollections. In cases where heterogeneity was revealed, multiple comparisons were performed using the Student-Newman-Keuls test (SNK test) in order to determine which subcollections accounted for the heterogeneity. Calculations for this specific test were made according to the formulae provided by Scherrer (1984). This analysis should clarify whether some subcollections are significantly older than others.

3. Number of Circulations Between 1978 and 1987

To determine whether use of titles differed among subcollections, a Kruskal-Wallis test was also applied to the circulation data. SNK-tests would be applied if distributions of circulation frequencies were found heterogeneous. These analyses should show if subcollections are used differently.

4. Relationship Between Age and Circulation

It is expected that, for a given subcollection, there could be an inverse relationship between the age of a title and its frequency of use. In order to check this hypothesis, the file was divided into two categories: books which have not circulated over the 10-year period specified, and books which have circulated at least once over the same period. For the complete collection and for each subcollection, Mann-Whitney tests were used in order to find any significant differences between age of books of both categories. A significance level was set at a 2-tailed probability of less than 0,05 ($p < 0,05$).

5. Relationship Between Age and Language

At the time of conducting this research, the **FSJ** Library did not have a written acquisition policy. However, one informal acquisition rule relating to language of publication has been followed by the acquisition librarian since 1979. This rule is that, if several books are equivalent in terms of treatment and content, French language materials are preferred to those published in English. Therefore, it might be inferred that French

books would tend to be of more recent origin than English books. In order to test this assumption, the file was divided into two categories based on languages : French books and English books. The bilingual books were excluded from this analysis, their number being negligible. Mann-Whitney tests were applied to the age data to reveal any differences between French and English books by subcollection. The significance level was set at 0,05 for a 2-tailed probability. This analysis should show, indirectly, if there is a trend towards the "francization" of the science collection.

6. Relationship Between Circulation and Language

It might also be assumed that the number of circulations of titles would be related to language of publication. This assumption is based on the fact that most course offerings are in French and students would prefer to use French books rather than English equivalents. This analysis involved only those books that have circulated at least once over the 10-year period specified. The file was divided into French and English books. A Mann-Whitney test was used to reveal any differences in circulation patterns between the two groups. Again, the significance level was set at 0,05. This analysis should show if there is a preference on the part of the readers for French or English publications.

III. RESULTS AND DISCUSSION

A. Estimation of the Science Collection Size

The meaning which is lent to the size of collections remains a concern among librarians. According to Bonn (1974, p. 265), "It is generally agreed that size does mean 'something' and that there is a positive correlation between the size of a library and, for example, the excellence of the academic institution to which the library belongs" As mentioned by Gardner (1981), this relationship between the size of collections and the excellence of their parent institution was used to derive the standards which serve to assess the adequacy of collection size. It has also been reported (Bonn, 1974 ; Lancaster, 1977) that the probability of a library responding to the needs of its clientele is related to collection size: the larger the collection the greater the probability of successful response. This assumption, however, is an oversimplification of the issue, and it is generally agreed today that the measurement of the size of the collection must be supplemented by analyses of qualitative features. Therefore, size is only meaningful as long as the collection meets the client needs in terms of quality of information available.

A common procedure used to assess the adequacy of collection size is to compare, for a given type of library, an observed value with established standards that are widely accepted among librarians. For example, such standards were established for academic libraries by the Canadian Association of College and University Libraries (1971) and the Association

of College and Research Libraries (1975). In addition, attempts have been made to develop formulae which would allow the calculation of a minimum size adequacy according to selected criteria (e.g. Clapp and Jordan, 1965; McInnis, 1972).

However, in spite of the efforts made to justify and support the sources and values used to calculate such standards, the arbitrariness involved in the process is flagrant, and therefore, undermines their reliability. Besides, the American Library Association (Perkins, 1979) admits that knowledgeable people disagree in the application of standards.

Although, the use of standards is a simple and convenient way to assess collection size, this method was not used in the present study because of its lack of demonstrated validity. Instead, it seemed more appropriate to analyse the size of the science collection relative to the whole collection, and to assess its adequacy against information generated internally such as the number of courses offered in various science fields, and the number of students enrolled in science courses.

The total size of the **FSJ** Library general collection is estimated to be nearly 44 730 titles and 58 600 volumes (see Appendix 1). Comparatively, the holdings of the science collection are estimated to be 2390 titles and 2835 volumes, or respectively 5,3% and 4,8% of the general collection (Table 3). The science collection size in terms of volumes was derived from the copies and volumes data. A detailed description of the data is provided in Appendix 2 along with the formula used to estimate the number of volumes. A ratio of 1 title to 1,2 volumes was derived from these data as well.

Table 3. Number of titles in the science collection, by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Titles		Number of FSJ courses **
		Number*	Percent	
Q	General Science	215	9,0	
QA	Mathematics	566	23,7	7
QB	Astronomy	75	3,1	
QC	Physics	421	17,6	4
QD	Chemistry	372	15,6	5
QE	Geology	141	5,9	2
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QH	Natural History	253	10,6	1
QK	Botany	84	3,5	
QL	Zoology	153	6,4	2
QM	Human Anatomy	2	0,1	
QP	Physiology	101	4,2	2
QR	Microbiology	7	0,3	1
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QH-QR	Biology	600	25,1	6
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Q-QR	Science Collection	2390	100,0	24

* Estimated from the shelflist measurement (2,5 cm = 84 titles).

** Courses offered at the Faculté Saint-Jean according to the 1987/1988 Calendar (University of Alberta, 1987).

During the fiscal year 1987-1988, the **FSJ** Library spent 14360 dollars for new monographs. Out of this sum, 2170 dollars were spent for scientific books, that is, 15% of the total book expenditures (Henley, 1988). This percentage is quite similar to the proportion of Full Time Equivalent (FTE) students enrolled in science courses. Indeed, it has been determined that 60 FTE students were enrolled in science (Appendix 3), that is nearly 13% of the 473 FTE students enrolled in the various programs offered by

the **FSJ** in 1987-1988 (Henley, 1988). However, if the amount of money spent on science books is translated into the number of new titles acquired, then about 40 volumes were added to the science collection (personal communication, Acquisition Librarian) which is a growth rate of only 1,4%. This latter value is rather low when considering the science collection is already relatively small, and currency of publication in science is a major concern. In addition, this rate of growth does not appear to reflect the increasing number of FTE students enrolled in science courses at the Faculté Saint-Jean. Indeed, according to figures compiled from data supplied by the Admission Office of the **FSJ**, 58% of FTE students enrolled in science are in the first year of their program.

A detailed analysis of the science collection reveals that the size of topical subcollections tends to increase with the number of courses offered in the respective discipline (Table 3). For example, seven courses are offered in Mathematics and six in Biology. The collection for these disciplines account for 23,7% and 25,1%, respectively of the total science collection. In contrast, the holdings in Geology represent only 5,9% of the science collection while two courses are offered. Intermediate figures are observed as well in Physics and Chemistry. However, the low share of the total holdings observed in Microbiology (0,3%) is noteworthy when this course has been offered since 1978 at the Faculté Saint-Jean (see Appendix 3).

In conclusion, it is clear from this analysis that the size of the science collection is small relative to the general collection. Moreover, its growth rate in 1987-1988 is low when it is known that in science, books are subject to rapid obsolescence, and recency of publications is

usually critical. In consequence, the rate of replacement and addition should be higher than in other fields (e. g. Humanities; Social Sciences) where the rate of obsolescence is reported to be slower (see for example Canadian Association of College and University Libraries, 1971). Moreover, the current rate of growth does not reflect the increasing number of students enrolled in science studies in the **FSJ**. Finally, the size of subcollections reflects rather well the number of courses offered in the corresponding scientific fields. Microbiology which is the only exception, is likely not adequately supported by the **FSJ** Library.

B. Age of Content

It is generally agreed that scientists, to keep abreast in their respective fields, rely on the most current printed sources, and more particularly on scholarly journals, technical reports and conference proceedings. In contrast, undergraduate students in science, who are more concerned with learning the basic principles of broad subjects, probably rely more on monographs, especially textbooks and reference materials. Although the printed sources of information used by researchers and undergraduate students may differ in several ways, currency remains a common denominator. As a consequence, academic libraries are expected to provide not only landmark works, but also the latest edition of relevant publications. Therefore, the age of the content of books might be used as an indicator of the currency of a science collection, and indirectly, as a measure of its usefulness. However, it should be remembered that this relationship between currency and usefulness is not absolute, and may vary from one scientific discipline to another, and among works within the same discipline.

Table 4 shows that the mean age of the **FSJ** science book collection is 32,2 years, which translates into the publication date 1955. The range is less than one year to 164 years, ranging in publication dates from 1987 to 1823. This figure, broken down by disciplines, reveals that Astronomy, with an average age of 47,5 years, is the oldest subcollection. Moreover, the mean ages in Botany and General Science, which are 41,3 years and

Table 4. Age of content of books in the science collection by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Titles (n)	Mean (\bar{x})	Standard Deviation	Range (Age)	
					Minimum	Maximum
Q	General Science	158	38,5	25,4	1	135
QA	Mathematics	299	32,4	25,9	<1	129
QB	Astronomy	74	47,5	33,3	2	111
QC	Physics	245	28,5	18,0	<1	136
QD	Chemistry	251	30,6	20,0	1	164
QE	Geology	112	29,2	25,2	<1	115
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QH	Natural History	131	24,1	21,2	1	113
QK	Botany	48	41,3	29,3	5	103
QL	Zoology	67	32,1	23,1	2	89
QM	Human Anatomy	2*	16,5	14,9	6	27
QP	Physiology	57	33,9	22,1	1	103
QR	Microbiology	7*	38,7	17,0	16	68
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QH-QR	Biology	312	30,6	23,8	1	113
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Q-QR	Science Collection	1451	32,2	24,2	<1	164

* Given the small size of these samples, statistics are meaningless. However they are reported here since they are considered for further statistical calculations involving the Biology subcollection and the Science Collection in general.

38,5 years respectively, are also greater than the mean age of the science collection as a whole. It is noted that there are no specific courses for any of these three disciplines, and, at least in Botany, the subcollection is almost stagnant with only 2 % of books less than 10 years old (Table 5). On the other hand, the Natural History subcollection seems to be the most recent, with a mean age of 24,1 years, followed by the Physics and Geology subcollections, with average ages of 28,5 and 29,2 years respectively.

Figure 1 and Table 5, show the age distribution for the whole science collection and for each subcollection. It is noted that only 15% of the books in the Science Collection are less than ten years old. The percentage of titles less than 10 years old is higher than the value observed for the whole collection in Natural History, Mathematics, Geology, and Biology with 30%, 23%, 22%, and 17 % respectively. Books in Natural History are remarkably recent in comparison to the rest of the science collection, with over 50% of titles less than 20 years old.

On the other hand, as mentioned above, in Botany, books less than 10 years old represent only 2% of the titles. The growth of this specific subcollection declined abruptly 10 years ago, that is when the institution became officially a Faculté. This decline may be due to the fact that no specific course in Botany is offered by the **FSJ**.

A more dramatic figure is observed in Chemistry, a discipline currently taught at the **FSJ**. Only 5% of the Chemistry books are less than 10 years old, while nearly 74% of the titles more than 20 years old. This latter figure is surpassed only by the General Science and Astronomy subcollections, where 82% and 77% of publications are more than 20 years old.

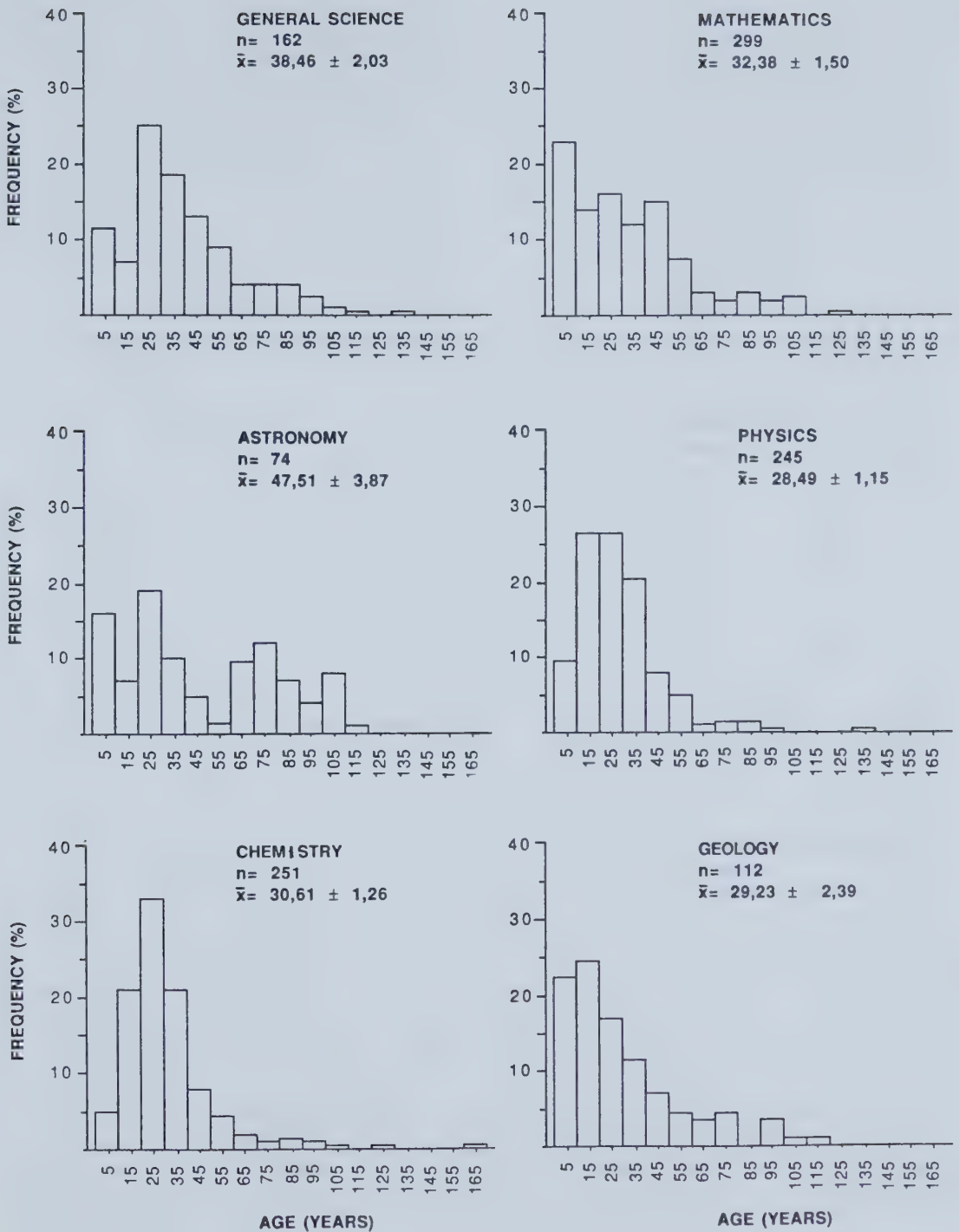


Figure 1. Age distribution of books in the science collection, by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988).

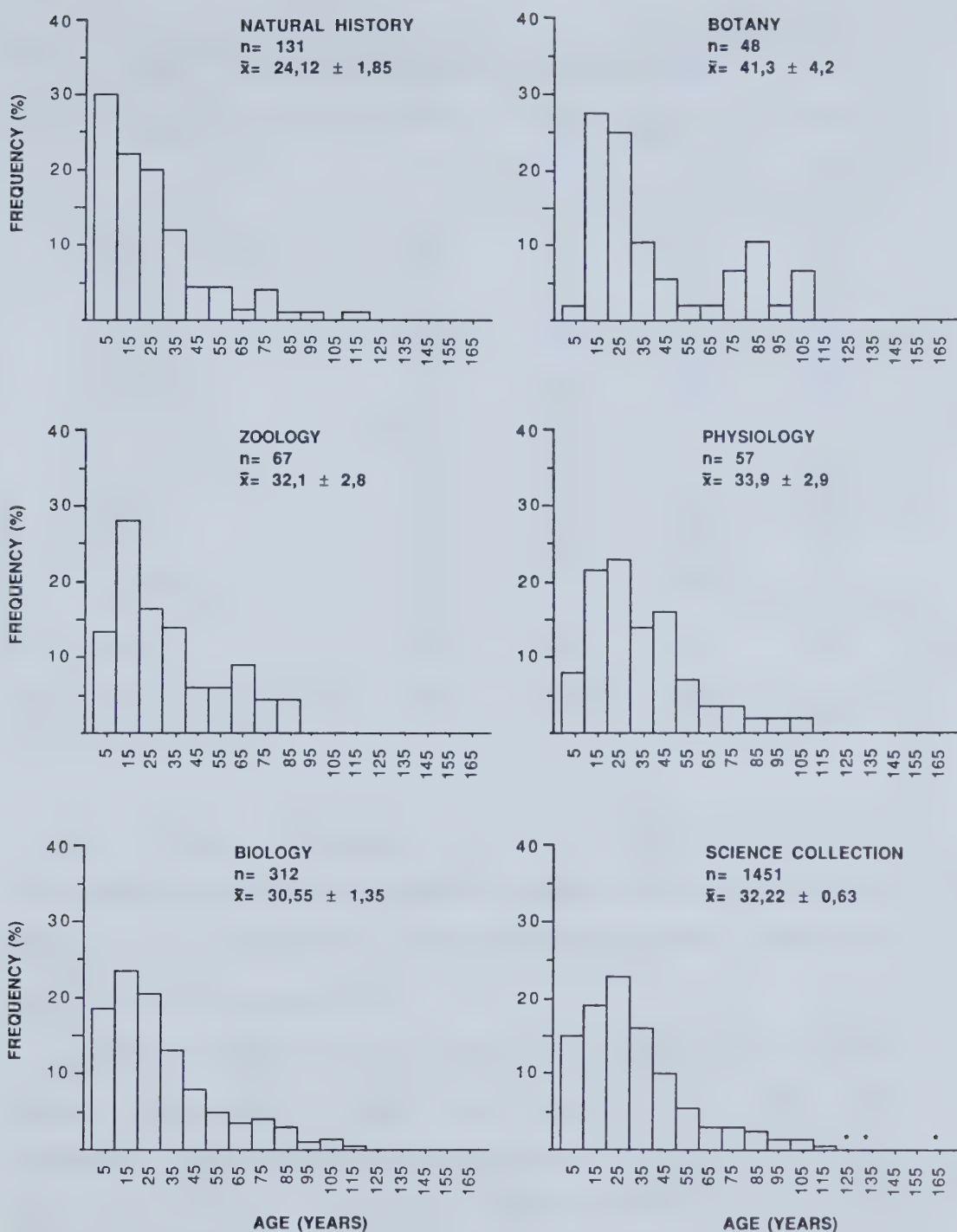


Figure 1 (continued). Age distribution of books in the science collection, by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988)

Table 5. Percentage of titles in the science collection by age of content (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Age (years)			
		<10	<20	<30	>30
Q	General Science	11,4	18,4	43,1	56,9
QA	Mathematics	23,1	36,8	52,9	47,1
QB	Astronomy	16,2	23,0	41,9	58,1
QC	Physics	9,0	35,1	61,2	38,8
QD	Chemistry	5,2	26,3	59,4	40,6
QE	Geology	22,3	46,4	63,4	36,6
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QH	Natural History	29,8	51,9	71,7	28,3
QK	Botany	2,1	29,2	54,2	45,8
QL	Zoology	13,4	40,3	56,7	43,3
QP	Physiology	7,0	28,1	50,9	49,1
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QH-QR	Biology	17,3	40,7	61,2	38,8
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Q-QR	Science Collection	14,7	33,6	56,4	43,6

Table 6 shows the results of the Kruskal-Wallis test of the homogeneity of age distributions among disciplines. This test reveals the existence of heterogeneous age distributions among disciplines ($H_{cor}=37,49$ and $\chi^2_{0,01(6)}=16,81$).

Moreover, the SNK multiple comparisons tests (Table 7) shows that the General Science and Astronomy subcollections have similar age distributions, while these differ significantly ($p < 0,05$) from all other disciplines. In addition, the age distribution in Chemistry is significantly different from all other disciplines, while Mathematics, Physics, Biology

and Geology do not differ one from another. This analysis confirms the peculiarities noted earlier concerning the Chemistry subcollection. The mean age of 30,6 years is misleading and the percentage of recent materials (less than 10 years old) is much lower than any other disciplines included in the curriculum.

Table 6. Kruskal-Wallis test of age distributions of books among subcollections.

Subcollections	Titles (n)	Mean Ranks	H_{cor}	$\chi^2_{0,01(6)}$
Astronomy	74	904,47	37,49	16,81
General Science	158	852,34		
Chemistry	251	727,29		
Mathematics	299	719,27		
Physics	245	690,94		
Biology	312	683,33		
Geology	112	640,46		

Table 7. Student-Newman-Keuls (SNK) multiple comparisons analyses of age differences between pairs of subcollections.

Subcollections	General Science	Chemistry	Mathematics	Physics	Biology	Geology
Astronomy	0,88	3,20*	3,41*	3,84*	4,08*	4,21*
General Science		2,94	3,23*	3,78*	4,14*	4,10*
Chemistry			0,22	0,97	1,24	1,82
Mathematics				0,79	1,06	1,70
Physics					0,21	1,06
Biology						0,93

Astronomy General Science Chemistry Mathematics Physics Biology Geology**

* A difference is significant for $Z_H > Z_{0,05} = 3,0$.

** The subcollections underlined are not significantly different.

In conclusion, to the extent that age of content reflects the usefulness of scientific publications, the **FSJ** Library's science collection is largely out-dated. As a matter of fact, the mean age of books is 32,2 years which, translated into year of publication, stands for 1955. Moreover, 44% of titles are older than 30 years. The obsolescence of the collection is easy to demonstrate by citing some important scientific findings or developments that have occurred in science since 1955, the mean year of publication in the science collection sample. For example, in the 1950's, computers were in their first-generation while the first microcomputers were launched at the end of the 1970's (Curtin and Porter, 1986). In Biology, genetic engineering, AIDS and acid rain were not social concerns until recently. In Physics, the basic laser patent was awarded in 1960 (Considine, 1983) and continues to have a large impact on several scientific disciplines. Finally, in Geology the theory of Plate Tectonics which, according to some scientists, has "revolutionized" the earth sciences (Condie, 1982), has been largely accepted for only one decade.

Also, this analysis has shown that the mean age of the collection varies among the disciplines. However, one positive trend to note is that there are more current materials in those disciplines which are included in the present curriculum. Nevertheless, Chemistry is an exception, with a relatively obsolete collection compared to other disciplines taught at the **FSJ**.

C. Circulation

The measurement of book circulation represents an additional characteristic which can be used to assess the adequacy of the science

collection for curriculum support. This form of collection evaluation assumes that each recorded circulation is a valid expression of its utility. In other words, the more a collection circulates, the more it is assumed to be meeting clientele needs. The concern here, is to find out to what extent the science collection is used overall, and to determine whether use varies according to discipline.

The books sampled ($n=1470$) from the science collection have circulated an average of 0,75 times between 1978-1987 (Table 8). The range was 0 to 16 circulations. More than 70% of books did not circulate even once during the 10-year period under study (Figure 2). Moreover, only 10% of the books circulated more than twice during the same period. Similar trends are observed in Mathematics and Astronomy. Lower performances are noticed in General Science and Chemistry with a respective average of 0,3 and 0,4 circulations per title during the period specified. In addition, more than 82% of books in both of these subcollections did not circulate at all (Figure 2). In contrast, higher averages are observed in Biology with 1,2 circulations, and Geology with 1 circulation per title. Also, for both subcollections, a larger proportion of their total holdings have circulated; 45% of books were borrowed at least once.

Table 8. Mean circulation of the science books collection during the 1978-1987 period (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Titles (n)	Mean* (\bar{x})	Standard Deviation	Minimum	Maximum
Q	General Science	161	0,3	1,1	0	8
QA	Mathematics	297	0,8	1,8	0	16
QB	Astronomy	75	0,7	1,9	0	15
QC	Physics	256	0,6	1,5	0	11
QD	Chemistry	248	0,4	1,6	0	15
QE	Geology	111	1,0	1,6	0	11
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QH	Natural History	136	1,1	2,0	0	12
QK	Botany	49	1,3	1,8	0	8
QL	Zoology	71	1,5	2,6	0	14
QM	Human Anatomy	2	0,5	0,7	0	1
QP	Physiology	56	1,1	2,0	0	9
QR	Microbiology	7	0,4	0,8	0	2
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QH-QR Biology		322	1,2	2,1	0	14
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Q-QR Science Collection		1470	0,8	1,8	0	16

* Values presented are the average number of time items were borrowed between 1978-1987.

This very low use of the science collection may be attributed to several factors. The first cause that comes to mind is the obsolescence of the collection, as demonstrated earlier. A second factor to take into consideration is the availability to **FSJ** students of the University of Alberta Library's science collection located in Cameron Library. Even if most of the books are in English, this library is more likely to satisfy **FSJ** science students' needs because of the diversity and currency of the materials available there. The low number of potential users could also

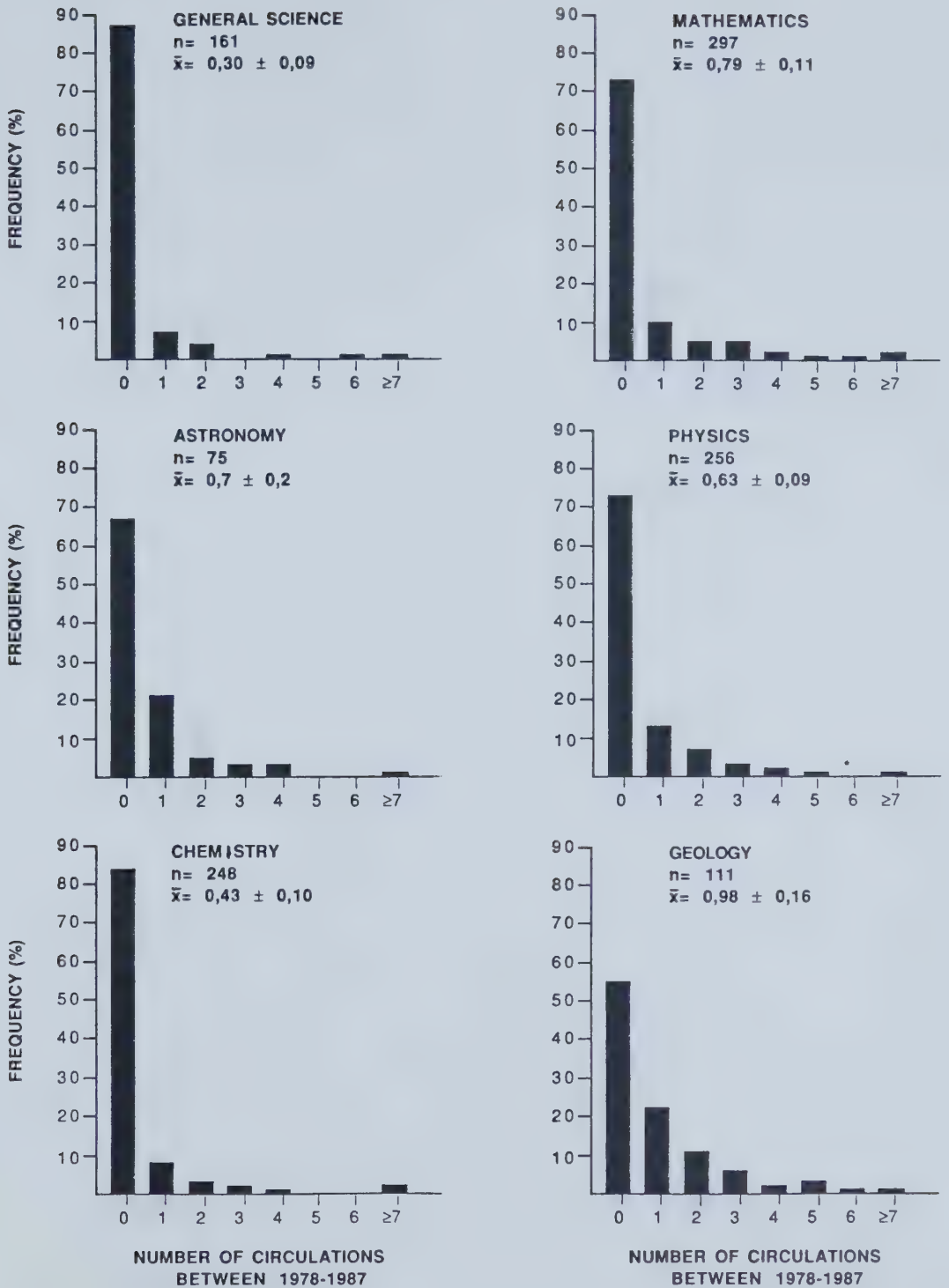
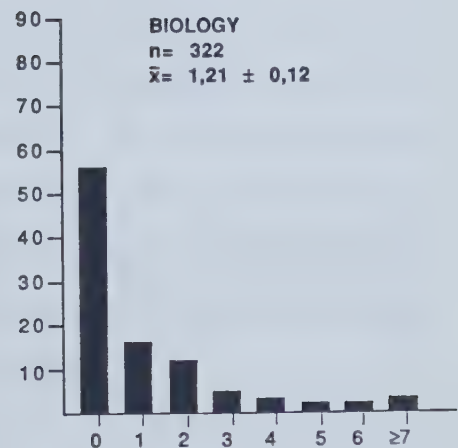
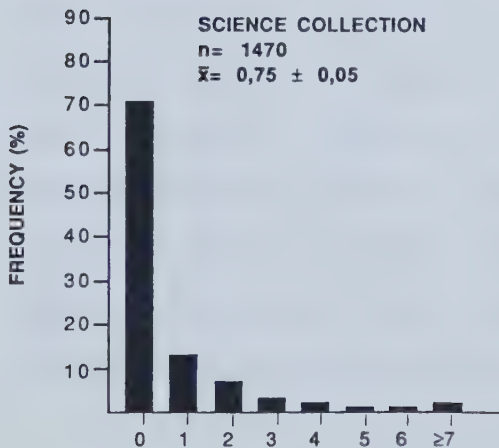
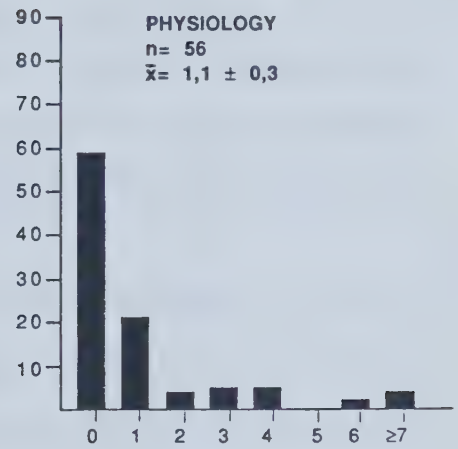
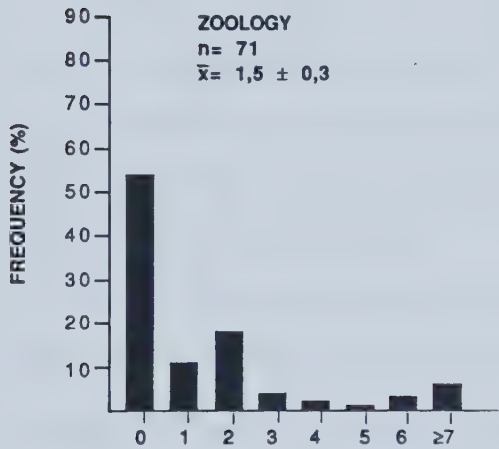
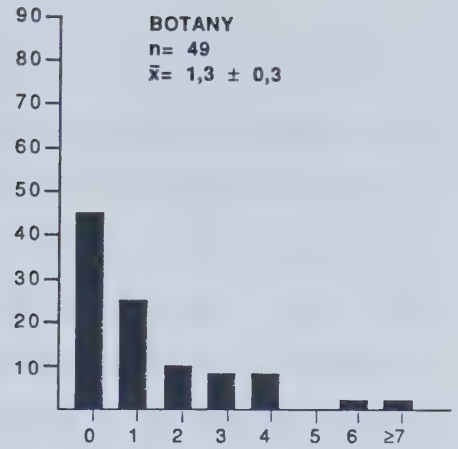
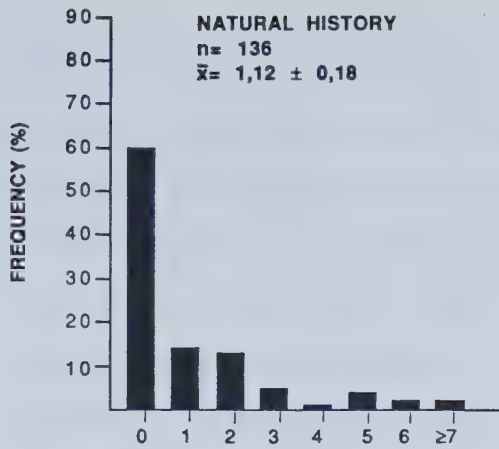


Figure 2. Circulation of books in the science collection between 1978 and 1987, by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988)



NUMBER OF CIRCULATION
BETWEEN 1978-1987

NUMBER OF CIRCULATIONS
BETWEEN 1978-1987

Figure 2 (continued). Circulation of books in the science collection between 1978 and 1987, by subcollections (Faculté Saint-Jean Library, University of Alberta, 1988).

explain this very low use made of the science collection, although enrollment statistics back to 1978 were not available to support this possibility. A last cause identified is related to the tediousness of finding needed materials through the **FSJ** Library catalogue. Indeed, a client who seeks materials on a given subject must go through four steps. One subject card catalogue is in English, and includes the material catalogued up to 1982, while a second subject card catalogue is in French and covers the period 1982-1984. Since then, newly acquired titles are on a microfiche catalogue, and finally, to complete the search, users must look at the supplement to the microfiche catalogue. This tedious procedure would discourage anyone, especially if there are few titles found and those found are often out of date.

The rate of use of the science collection is not homogeneous. Table 9 shows the variations among disciplines ($H_{\text{cor}} = 91,35$; $\chi^2_{0,01(6)} = 16,81$). However, as Table 10 demonstrates, it was not possible to determine which subcollections caused this heterogeneity, because the SNK tests did not provide conclusive evidence. In Table 10, the subcollections which show no significant difference are underlined. In fact, the results obtained with the SNK tests are inconsistent, and this could be attributable to a type II error for which the risk is not measurable (Sokal & Rohlf, 1979 ; Scherrer, 1984). A type II error occurs when a false null hypothesis is accepted while it should be rejected.

Table 9. Kruskal-Wallis test of circulation distributions of books among subcollections.

Subcollections	Titles(n)	Mean Ranks	H_{cor}	$\chi^2_{0,01(6)}$
Biology	321	849,89	91,35	16,81
Geology	111	845,60		
Astronomy	75	751,13		
Mathematics	297	728,07		
Physics	256	719,39		
Chemistry	248	634,68		
General Science	161	614,30		

Table 10. Student-Newman-Keuls (SNK) multiple comparisons analyses of circulation differences between pairs of subcollections.

Subcollections	Geology	Astronomy	Mathematics	Physics	Chemistry	General Science
Biology	0,09	1,82	3,57*	3,68*	3,64*	5,75*
Geology		1,49	2,49	2,62	4,36*	4,42*
Astronomy			0,28	0,39	1,42	1,63
Mathematics				0,24	2,55	2,74
Physics					2,01	2,26
Chemistry						0,48

Biology Geology Astronomy Mathematics Physics Chemistry General Science **

* Difference between pairs are significant for $Z_H > Z_{0,05} = 3,0$.

** The subcollections underlined are not significantly different.

D. Relationship Between Age and Circulation

As already mentioned, it is generally agreed that currency is of critical importance in science, and that there is a relationship between the age of a science book and its "usefulness", the latter being expressed in terms of number of circulations over a given period of time. From these assumptions, it would be reasonable to infer that books which did not circulate at all between 1978 and 1987 would tend to be older than books which had circulated at least once during this period.

A Mann-Whitney test applied to the age distributions of the science books collection showed a highly significant difference between circulating and non-circulating titles over the study period ($p < 0,0001$). Table 11 shows that the mean age observed for books which did not circulate was 35,5 years, compared to 25,2 years for books which had circulated at least once. Analysis by discipline reveals significant differences in the same direction for Mathematics, Physics, Chemistry, Geology and Biology ($p < 0,05$). Among the biological subdisciplines, the same observation holds for Botany and Zoology. Moreover, a similar trend is noticed in Natural History and Physiology, though differences are statistically not significant. In fact the only discipline where such a trend is not observed is in Astronomy, where titles which circulated are as old as those which did not. This may be due to the fact that the obsolescence of information in this specific field is slower than in other scientific disciplines.

As a general conclusion to this section, it appears that the recency of book content is an important criterion in the choice of books by users and the use of the science collection as a whole.

Table 11. Mann-Whitney test of age differences observed between circulating and non-circulating books, 1978-1987 (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Mean Age \pm SE (n)		Z _{observed}	2-tailed p
		0 circulation	≥ 1 circulation		
Q	General Science	40,0\pm2,3 (137)	28,2\pm2,8 (20)	-1,7089	0,0875
QA	Mathematics	36,4\pm1,8 (211)	22,7\pm2,4 (80)	-4,4098	0,0000**
QB	Astronomy	48,1\pm4,9 (49)	46,4\pm6,4 (25)	-0,1829	0,8549
QC	Physics	30,7\pm1,5 (173)	23,1\pm1,4 (68)	-3,0182	0,0025**
QD	Chemistry	32,2\pm1,3 (207)	24,4\pm3,9 (39)	-3,7740	0,0002**
QE	Geology	37,4\pm3,8 (57)	21,4\pm2,6 (50)	-3,0013	0,0027**
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QH	Natural History	27,4\pm2,7 (76)	19,5\pm2,7 (53)	-1,5734	0,1156
QK	Botany	53,2\pm6,6 (21)	32,0\pm4,9 (27)	-2,5681	0,0102**
QL	Zoology	38,4\pm4,3 (34)	25,6\pm3,5 (32)	-2,1561	0,0311**
QP	Physiology	38,7\pm4,3 (33)	28,3\pm3,4 (23)	-1,4994	0,1338
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QH-QR	Biology*	35,4\pm2,0 (170)	24,9\pm1,7 (138)	-3,6549	0,0003**
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Q-QR	Science Collection*	35,5\pm0,8 (1004)	25,2\pm1,0 (420)	-8,6571	0,0000**

* Calculations include samples from QM=2 and QR=7.

** A difference between the two classes is significant for $p < 0,05$.

E. Language of Publication

The emphasis on French language materials is clearly stated in the goals and objectives of the **FSJ** Library (University of Alberta, 1986). This emphasis matches the existing philosophy of the parent institution which states that French is the main language of instruction. For instance, among the 24 science courses offered by **FSJ**, only four are taught in English, all of them in Biology (see Appendix 5). Moreover, at the time of conducting this study, although the **FSJ** Library did not have written collection development policy, there was a verbal agreement to give priority to the acquisition of French language materials (personal communication, Acquisition Librarian). Given this preferential selection policy, and taking into consideration the other observations stated above,

it would be reasonable to infer that the FSJ Library's science collection should contain significantly more books in French than in English.

However Table 12 shows that it is not the case. Over 55% of the collection is in English while only 44% is in French. Bilingual titles represent, overall, less than 1% of the study sample. The proportion of French titles in the areas of General Science, Mathematics, and Physics, which together constitute nearly half of the science holdings, are similar to the proportion for the whole science collection.

Table 12. Language of publication of the science collection by subcollection (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Titles (n)	Language(% of titles)		
			French	English	Bilingual
Q	General Science	162	44,4	54,9	0,6
QA	Mathematics	304	45,1	54,6	0,3
QB	Astronomy	75	62,7	37,3	0,0
QC	Physics	258	40,7	58,5	0,8
QD	Chemistry	252	21,0	78,6	0,4
QE	Geology	116	62,1	37,9	0,0

QH	Natural History	137	59,1	40,1	0,7
QK	Botany	48	33,3	66,7	0,0
QL	Zoology	72	52,8	47,2	0,0
QM	Human Anatomy*	2	50,0	50,0	0,0
QP	Physiology	57	54,4	45,6	0,0
QR	Microbiology*	7	42,9	57,1	0,0

QH-QR	Biology	323	52,9	46,8	0,3

Q-QR	Science Collection	1490	44,1	55,5	0,4

* Given the small size of these samples, statistics are meaningless. However they are reported here since they are considered for further statistical calculations the Biology subcollection and the Science Collection in general.

On the other hand, the proportion of French titles is higher than average in Astronomy, Geology, and Biology representing about 60% of these subcollections. If the biological subdisciplines are analysed separately, the percentage of French titles ranges from 33% in Botany to 59% in Natural History. Overall, the Biology subcollection contains a higher proportion of French titles (53%) than the 44% found in the science collection taken as a whole.

A reverse trend is observed in Chemistry where only 21% of the titles are in French. It is noted that the subcollections which show the lowest percentage of French titles, that is Chemistry and Botany, are also the two disciplines which showed the lowest percentage of books less than ten years old (Figure 1). While this situation is understandable for Botany, which is not included in the curriculum, it is hardly acceptable for Chemistry in which five courses are taught in French.

The fact that most of the books making up the science collection were probably acquired before the creation of the **FSJ** in 1977 could explain why the preference for French language materials is not yet "visible". As shown earlier, a large proportion of the collection consists of old material, and this could mask the effect of the current acquisition policy in favor of French language books. A second factor which may slow down the francization of the science collection is the lack of French literature in various scientific disciplines. Indeed, it has been accepted for some time that English is the dominant language of science (Cooper, 1983). This is especially true for the most current publications such as scholarly journals and conference proceedings. Until recently, this was equally true of materials in several disciplines for materials intended for undergradu-

ate students. However, the number of science publications and translations in French for this audience level has increased over the last decade and, as a consequence, such an argument for the disproportionately low number of French books in the **FSJ's** science collection is no longer defensible.

F. Relationship Between Age and Language

Another way to verify whether the informal language policy for acquisition by the **FSJ** Library is consistently being followed is by comparing the recency of French and English science materials. In spite of the fact that the policy has likely been applied for only 10 years, its application should have resulted by now in a science collection with more current French publications than English ones. Therefore, it could be hypothesized that the French titles would be more recent than the English titles in the **FSJ** Library science collection.

A Mann-Whitney test applied to the data revealed a highly significant difference ($p < 0,0001$) between age of books according to their language. Thus, Table 13 shows that English titles, with a mean age of 37 years, are significantly older than French titles with a mean age of nearly 26 years. Moreover, significant differences were observed as well in General Science, Mathematics, Physics, Geology, and Biology where French titles are more recent than English ones. The largest differences are found in Mathematics and Geology, where French titles have a mean age of 16 years each while the English titles in Mathematics have a mean age of 46 years and those in Geology 36 years.

Table 13. Mann-Whitney test of age differences of books, by language of publication (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Mean Age \pm SE (n)		Z _{observed}	2-tailed p
		French	English		
Q	General Science	31,8 \pm 3,1 (70)	44,1 \pm 2,6 (87)	-3,2375	0,0012**
QA	Mathematics	16,0 \pm 1,4 (133)	45,6 \pm 1,9 (164)	-10,8277	0,0000**
QB	Astronomy	49,0 \pm 5,1 (46)	45,0 \pm 6,0 (28)	-0,3456	0,7296
QC	Physics	24,1 \pm 2,0 (99)	31,8 \pm 1,4 (142)	-4,8033	0,0000**
QD	Chemistry	31,0 \pm 3,4 (52)	30,3 \pm 1,3 (197)	-0,7267	0,4674
QE	Geology	24,6 \pm 2,6 (71)	37,3 \pm 4,5 (41)	-2,5559	0,0106**
<hr/>					
QH	Natural History	16,6 \pm 1,7 (78)	35,8 \pm 3,4 (50)	-5,8005	0,0000**
QK	Botany	37,1 \pm 7,2 (15)	42,6 \pm 5,4 (32)	-0,4567	0,6479
QL	Zoology	34,2 \pm 3,7 (36)	29,7 \pm 4,3 (31)	-1,0880	0,2766
QP	Physiology	28,8 \pm 3,1 (31)	40,0 \pm 5,1 (26)	-1,3222	0,1861
<hr/>					
QH-QR	Biology*	25,0 \pm 1,6 (165)	36,9 \pm 2,2 (167)	-4,5996	0,0000**
<hr/>					
Q-QR	Science Collection*	25,9 \pm 0,1 (636)	37,3 \pm 0,8 (801)	-11,2735	0,0000**

* Calculations include samples from QM=2 and QR=7.

** A difference between the two classes is significant for $p < 0,01$.

On the other hand, in Astronomy, Chemistry and Zoology, even though there are no significant differences, the mean ages found for English books tend to be the same or lower than those for French titles. One possible explanation for this trend in the area of Chemistry is that only 5% of such books are less than ten years old (see Table 5). This implies relatively few acquisitions for this subcollection, and consequently it does not reflect the current language policy adopted by the **FSJ** Library.

6. Relationship Between Circulation and Language

Language might also be an independent variable which affects either indirectly or directly the use of the **FSJ** science collection. For example,

it has been observed that French language titles tend to be more current than English titles, and it is assumed that the recently published books in the science collection will circulate more frequently than older books. Moreover, since the **FSJ** Library serves a community which functions mainly in French, it could also be assumed that French language materials would tend to circulate more than the English. Therefore, it would be reasonable to hypothesize that French books circulate more than English books in the science collection.

A Mann-Whitney test applied to the age of titles revealed that the French language books in the science collection circulate more than English books (Table 14). In fact, the average circulation frequency of French titles (0,9) is significantly higher than the average for English titles (0,6; $p < 0,0001$). Moreover, French books circulated more than English titles in General Science, Mathematics, and Physics ($p < 0,05$). A similar trend was observed in Chemistry, Natural History, and Physiology, even though differences are not statistically significant at the 0,05 level.

On the other hand, English books circulated more ($p < 0,007$) than French titles in Botany. A similar trend is noted in Astronomy, Geology, and Zoology, although again, differences are not statistically significant ($p < 0,05$).

Table 14. Mann-Whitney test of circulation differences observed between circulation of books, by language of publication, 1978-1987 (Faculté Saint-Jean Library, University of Alberta, 1988).

LC Code	Subcollections	Mean circulation \pm SE (n)		Z_{observed}	2-tailed p
		French	English		
Q	General Science	0,5\pm0,2 (72)	0,1\pm0,1 (88)	-2,1638	0,0305*
QA	Mathematics	1,3\pm0,2 (133)	0,3\pm0,1 (162)	-4,7946	0,0000*
QB	Astronomy	0,4\pm0,1 (47)	1,3\pm0,6 (28)	-0,5194	0,6035
QC	Physics	0,8\pm0,2 (102)	0,5\pm0,1 (151)	-2,0269	0,0427*
QD	Chemistry	0,5\pm0,2 (50)	0,4\pm0,1 (196)	-1,2985	0,1941
QE	Geology	0,8\pm0,1 (72)	1,3\pm0,4 (39)	-0,0545	0,9565
<hr/>					
QH	Natural History	1,4\pm0,3 (79)	0,8\pm0,2 (54)	-1,0290	0,3035
QK	Botany	0,4\pm0,2 (16)	1,8\pm0,3 (32)	-2,6876	0,0072*
QL	Zoology	0,9\pm0,2 (37)	2,2\pm0,6 (34)	-1,1121	0,2661
QP	Physiology	1,3\pm0,4 (30)	0,8\pm0,4 (26)	-0,3893	0,6971
<hr/>					
QH-QR	Biology**	1,1\pm0,2 (167)	1,3\pm0,2 (150)	-1,0131	0,3110
<hr/>					
Q-QR	Science Collection**	0,9\pm0,1 (643)	0,6\pm0,1 (814)	-5,0861	0,0000*

* Difference between the two classes is significant for $p < 0,05$.

** Calculations include samples from QM=2 and QR=7.

IV. CONCLUSION

A. Science Collection

The present analysis shows that the Faculté Saint-Jean Library's science collection is relatively small, largely obsolete, underused, and dominated by English language titles. Indeed, its share of the general collection holdings represents only 5,3% of the titles and 4,8% of the volumes. Moreover, its growth rate in terms of volumes was only 1,4% in 1987-88.

The obsolescence of the science collection is revealed by the mean age of its titles: 32,2 years. Only 15% of titles are less than 10 years old, and 60% are older than 20 years. However, mean ages vary considerably by subcollections, ranging from 24 years for Natural History to 47,5 years for Astronomy.

This obsolescence of the science collection could explain the very low usage of most of titles with an average number of circulations per title during the 1978-1987 period of only 0,75 circulations. More than 70% of titles did not circulate at all during this 10-year period. Moreover, the mean age of books which circulated at least once was 25 years, a considerable concern in science, where currency of information is paramount. This situation may reflect a serious deficiency in recent materials. In spite of the fact that the science collection is still dominated by English titles, French titles circulate more frequently. The higher circulation of French titles might be due to the language, or to the fact that the French titles are of more recent origin than English books in several of the subcollections.

The following sections summarize the major findings for each of the subcollections under study. This is done in order to integrate the information for each of them and provide a clearer overview of the situation by subcollections.

B. Mathematics

This subcollection could be described as one of the "healthiest" of the science collection. It accounts for 24% of the science collection, and, after the Natural Science subcollection, is the subcollection with the highest percentage of titles less than 10 years old. However, with 63% of books older than 20 years and a mean age of 32,4 years, this subcollection remains rather old. It has a large mean age difference between French and English titles. Indeed, there is a difference of 30 years in favor of French books. This could explain the higher average number of circulations of French titles (1,3) over English books (0,3). Seven courses are offered in Mathematics. This could explain the relatively good figures observed for this subcollection, a trend that should be maintained.

C. Astronomy

Astronomy is by far the oldest subcollection with a mean age of 47,5 years. Its share of the science collection is modest with only 3,1% of the titles. In spite of its age, the number of circulations is the same as the science collection as a whole. Also surprising is the mean age of books which circulated at least once over the period specified, 46,4 years or books published around 1940. Also, this subcollection is peculiar because

it contains the higher proportion of French titles among all disciplines. However, French language books tend to circulate less frequently than English ones, for reasons which remain obscure. The development of this subcollection is not imperative as long as it is not the subject of a specific course in the curriculum.

D. Physics

With nearly 18% of the science collection classified under this subject, the share held by this subcollection is rather fair, especially when it is considered that four courses are offered in the curriculum. The average age of this subcollection is one of the lowest, in spite of the fact that only 9% of books are less than 10 years old. This latter value is much below the percentage observed for the science collection. In fact, over 50% of titles were published between 1957-1977, a characteristic which explains the relatively low mean age observed. The percentage of French books is slightly less than the figure noted for the science collection. However, as showed by the recency analysis, the French language titles are more current than English books, an observation which indicates a trend for the francization of this subcollection. In comparison with other disciplines, books from this subcollection tend to circulate less often. In conclusion, current titles should be added to this subcollection, mainly in French.

E. Chemistry

The Chemistry subcollection accounts for 15,6% of the science collection and should support the five courses offered in the **FSJ** curricu-

lum. The average age of this subcollection is nearly 31 years, slightly inferior to the figure observed for the science collection. However, the percentage of books younger than 10 years (5%) is three times less than the percentage observed for the science collection (15%). Moreover, almost 74% of titles are older than 20 years, the worst figure among all subcollections. This subcollection contains only 21% of French titles, the lowest percentage observed in the science collection. If circulation reflects the usefulness of a collection, this one is the least useful with an average of 0,4 circulations, far below the general mean of 0,8 circulations. In addition, over 82% of books did not circulate at all during the 10-year period specified. In conclusion, this subcollection, more than any other, needs to be updated, and the number of French titles should be increased substantially.

F. Geology

Relative to other subcollections, the Geology figures are very positive. With two courses included in the curriculum since 1981, the percentage of nearly 6% of the science collection is acceptable. It has the third highest percentage of titles younger than 10 years and the second lowest percentage of books older than 20 years, with a mean age of the subcollection assessed to be 29 years. It has the second highest average number of circulations, and, with Biology, the highest percentage of books which have circulated at least once. Also, among the disciplines taught at the FSJ, it has the highest percentage of French language titles. However, while French titles are more current than English books, the former tend to circulate less than the latter. There might be a problem of relevancy to

the curriculum of the French books acquired recently. However, the data do not allow for any further speculations to explain this phenomenon. In conclusion, this subcollection seems well balanced with respect to the rest of the science collection and its current development should be maintained.

6. Biology

This is the most important subcollection in terms of size, containing 25% of the titles of the science collection. The general literature in Biology, which is classified under the subdiscipline Natural History, accounts for 42% of the Biology holdings. In contrast, the Microbiology subcollection is underdeveloped when it is considered that a course has been offered for ten years while this subcollection contains only 0,3% of the science collection.

The mean age of the Biology subcollection is estimated at 30,6 years, Natural History being the most current subcollection and Botany the oldest. Indeed, only 2% of the Botany books are less than 10 years old, indicating that this section of the Biology subcollection has ceased to grow since 1978. On the other hand, 30% of books are less than 10 years old in Natural History, the highest figure of the subcollections. In Physiology, the percentage of titles younger than 10 years is relatively low (7%), one half the percentage for the science collection (15%). This could indicate a deficiency in terms of currency for this subcollection.

The Biology subcollection is the most used with an average of 1,2 circulations per titles over the period 1978-1987. More than 45% of books

have circulated at least once (55% in Botany). The relatively high use made of the Botany subcollection is likely due to the inclusion of several works related to the Albertan flora which are heavily used.

Finally, the ratio of French books (53%) is higher than the value found for the science collection. This figure reaches 59% in Natural History. Although the French books are more recent than the English titles, the number of circulations do not differ according to language. On the contrary, English books in the Zoology subcollection tend to circulate more than French books. This may be due to the fact that the courses offered in Zoology are taught in English.

H. Summary

Overall, according to the results obtained through this study, the science book collection of the **FSJ** Library is believed to be deficient in several ways. On the other hand, the deficiencies are not uniform across subcollections, and the further development of the science collection should take into consideration these differences. This analysis should be supplemented by a study of the relationship between the science collection and the science curriculum available at the **FSJ**. Such a study is considered important because it could provide additional explanations for the low use of the existing collection. Finally, it is highly recommended that a written selection and collection development policy be produced. Such a yardstick document would be useful, if not necessary, to conduct a rational and objective evaluation of the **FSJ** collection.

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APPENDIX 1

DETAILED DESCRIPTION OF THE FACULTÉ SAINT-JEAN LIBRARY HOLDINGS.

Taken from:

Henley, Juliette J. 1988. **Bibliothèque-Faculté Saint-Jean: rapport annuel: 1er avril 1987 au 31 mars 1988.** Edmonton : University of Alberta.

Collection totale / Total Collection

	<u>1986-87</u>		<u>1987-88</u>		<u>TOTAL</u>	
	Titres/ <u>Titles</u>	Unités/ <u>Items</u>	Titres/ <u>Titles</u>	Unités/ <u>Items</u>	Titres/ <u>Titles</u>	Unités/ <u>Items</u>
<u>MONOGRAPHIES</u>						
Collection générale/ General collection	42,819	56,522	1,909	2,067	44,728	58,589
Collection spéciale/ Special collection	11,907	15,717	0	0	11,907	15,717
Microformes/Microforms	3,517	9,708	365	802	3,882	10,510
- Microfilms	(16)	(19)	(0)	(0)	(16)	(19)
- Microfiches	(3501)	(9,689)	(365)	(802)	(3,866)	(10,491)
Audio-visuel/Audio-visual	0	0	1	1	1	1
Publications officielles/ Government documents	6,000	7,920	903	980	6,903	8,900
TOTAL DES MONOGRAPHIES/ TOTAL MONOGRAPHS	64,243	89,867	3,178	3,850	67,421	93,717

PUBLICATIONS EN
SERIE/SERIALS

Collection générale/General collection	344	2,597	0	293	344	2,890
Collection spéciale/Special collection	*	*	0	0	*	*
Microformes/Microforms	80	2,824	0	734	80	3,558
- Microfilms	(69)	(1,215)		(191)	(69)	(1,406)
- Microfiches	(11)	(1,609)		(543)	(11)	(2,152)
Publications officielles/ Government documents	95	**	0	**	95	**
TOTAL DES PUBLICATIONS EN SERIE/TOTAL SERIALS	519	5,421	0	1,027	519	6,448
TOTAL DE LA COLLECTION/ TOTAL COLLECTION	64,762	95,288	3,178	4,877	67,940	100,165

NOTES

* - La répartition entre monographies et périodiques n'est pas connue donc le nombre de périodiques est inclus dans le nombre de monographies.

- Separate statistics were not kept for periodicals, therefore the number of periodicals is included in the number of monographs.

** - Puisque les numéros des périodiques des publications officielles n'ont pas encore été reliés, le nombre de volumes n'est pas disponible.

- Since the issues of the government documents periodicals have not yet been bound, the number

APPENDIX 2

EXTENT OF COPIES AND MULTI-VOLUME
TITLES IN THE FACULTÉ SAINT-JEAN LIBRARY'S
SCIENCE COLLECTION.

In order to estimate the size of the science collection in terms of volumes, for each title sampled, the number of copies and/or volumes held by the library was noted. The results of this analysis are summarized in Table 1 and Table 2.

The percentage of titles with in two or three copies is respectively 6,3% and 1,9%. Moreover, the percentage of titles published in several volumes is 4%, with the number of volumes ranging from two to twelve.

TABLE 1

Extent of duplication (% of titles)
in the science collection, by subcollection
(Faculté Saint-Jean Library, University of Alberta, 1988)

LC Code	Subcollections	Number of Copies		
		1	2	3
Q	General Science	89,5	9,3	1,2
QA	Mathematics	92,5	5,2	2,3
QB	Astronomy	90,7	8,0	1,3
QC	Physics	92,3	6,6	1,2
QD	Chemistry	92,9	5,9	1,2
QE	Geology	94,0	4,3	1,7
<hr/>				
QH	Natural History	92,8	6,5	0,7
QK	Botany	89,8	10,2	0,0
QL	Zoology	87,5	2,8	9,7
QP	Physiology	89,5	7,0	3,5
<hr/>				
QH-QR	Biology	90,8	6,1	3,1
<hr/>				
Q-QR	Science Collection	91,9	6,3	1,9

TABLE 2

Extent of multi-volume titles (%) in the
science collection, by subcollection.

LC Code	Subcollections	Number of Volumes							
		1	2	3	4	7	9	10	12
Q	General Science	92,6	4,9	1,9				0,6	
QA	Mathematics	96,7	2,6	0,7					
QB	Astronomy	96,0	2,7	1,3					
QC	Physics	95,0	3,1	0,4	0,8	0,4	0,4		
QD	Chemistry	97,6	1,6	0,8					
QE	Geology	95,7	2,6	0,9	0,9				
<hr/>									
QH	Natural History	96,4	2,2			0,7			0,7
QK	Botany	98,0		2,0					
QL	Zoology	95,8		2,8	1,4				
QP	Physiology	98,2		1,8					
<hr/>									
QH-QRBiology		96,9	0,9	1,2	0,3	0,3			0,3
<hr/>									
Q-QR Science Collection		96,1	2,4	0,9	0,3	0,1	0,1	0,1	0,1
<hr/>									

In order to determine the size of the book collection in volumes, the following formula was used:

$$N_v = \frac{P_t \times T_c}{100} \cdot (N_{cm} - 1)$$

where

N_v = number of volumes;

P_t = percentage of titles in n copies or n volumes;

T_c = number of titles in the collection;

N_{cm} = number of copies or volumes of a given title;

1 = volume, for a given title, already accounted in T_c .

APPENDIX 3

NUMBER OF FULL TIME EQUIVALENT (FTE) STUDENTS
ENROLLED IN SCIENCE AT THE FACULTÉ SAINT-JEAN
(UNIVERSITY OF ALBERTA), 1987-1988.

Bachelor Program (credits in science)		Year of Program				Total	Total FTE
		1	2	3	4		
Science (90)		31	16	8	-	55	55,0
Education	Major (36)	1	5	2	1	9	3,6*
	Minor (18)	2	1	1	-	7	1,4**
Total		34	22	14	1	71	60,0

* 9 students X 36 credits + 90 credits.

** 7 students X 18 credits + 90 credits.

APPENDIX 4

LIST OF SCIENCE COURSES OFFERED AT THE FACULTÉ SAINT-JEAN, UNIVERSITY OF ALBERTA, 1978-1988.*

Discipline	Course Number	Course Title	Offering Period
Biology	Biole 130	Introduction à la biologie	1978-83
	Biole 210	Biology and the Modern World	1978-79
	Biole 210	Biologie et le monde moderne	1979-88
	Biole 296	Evolutionary Biology	1978-86
	Biole 297	Heredity	1978-88
	Biole 299	Fonction biologique	1978-86
	Biole 301	Biologie cellulaire	1978-88
	Entie 209	Entomologie pour non-biologiste	1978-79
	Entie 209	Entomology for Non-Biologist	1979-88
	Micr 201	Elementary Microbiology	1978-88
	Zoole 220	Principles of Animal Biology	
Chemistry	Chim 100	Introduction à la chimie générale	1978-83
	Chim 200	Introduction à la chimie, niveau universitaire	1978-88
	Chim 202	Introduction à la chimie, niveau universitaire	1978-88
	Chim 250	Chimie organique	1978-88
	Chim 302	Chimie générale	1981-88
	Chim 350	Chimie organique	1978-88
Geology	Geole 202	Géologie physique	1981-88
	Geole 203	Histoire de la terre	1981-88
Mathematics	MathQ 202	Calcul élémentaire I	1978-88
	MathQ 203	Calcul élémentaire I	1984-88
	MathQ 204	Calcul élémentaire II	1978-88
	MathQ 221	Algèbre linéaire I	1981-88
	MathQ 222	Algèbre linéaire II	1981-88
	MathQ 302	Intermediate Calculus I	1978-82
	MathQ 302	Calcul intermédiaire I	1982-88
	MathQ 303	Intermediate Calculus II	1978-82
	MathQ 303	Calcul intermédiaire II	1982-88
Physics	PhysQ 202	Principes généraux de physique	1978-86
	PhysQ 240	Mechanics, Waves and Optics	1978-81
	PhysQ 242	Mécanique, électricité et magnétisme	1981-83
	PhysQ 241	Mécanique	1984-88
	PhysQ 243	Les ondes et l'électricité	1984-88
	PhysQ 300	Physique moderne	1978-79
	PhysQ 301	Aspects quantiques de la physique moderne	1979-88
	PhysQ 340	Heat, Electricity and Magnetism	1978-81
	PhysQ 340	La chaleur, l'électricité et le magnétisme	1981-82
	PhysQ 401	Physique nucléaire et particules élémentaires	1979-88

* Sources : calendars issued 1978-1988 by the Office of the Registrar of the University of Alberta

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APPENDIX 5

LIST OF SCIENCE COURSES OFFERED AT THE FACULTÉ SAINT-JEAN, UNIVERSITY OF ALBERTA, 1987-1988.*

Discipline	Course Number	Course Title	Teaching Language	
			French	English
Biology	Biole 210	Biologie et le monde moderne	x	
	Biole 297	Heredity		x
	Biole 301	Biologie cellulaire	x	
	Entie 209	Entomology for Non-Biologist		x
	Micre 201	Elementary Microbiology		x
	Zoole 220	Principles of Animal Biology		x
Chemistry	Chim 200	Introduction à la chimie	x	
	Chim 202	Introduction à la chimie	x	
	Chim 250	Chimie organique	x	
	Chim 302	Chimie générale	x	
	Chim 350	Chimie organique	x	
Geology	Geole 202	Géologie physique	x	
	Geole 203	Histoire de la terre	x	
Mathematics	MathQ 202	Calcul élémentaire I	x	
	MathQ 203	Calcul élémentaire I	x	
	MathQ 204	Calcul élémentaire II	x	
	MathQ 221	Algèbre linéaire I	x	
	MathQ 222	Algèbre linéaire II	x	
	MathQ 302	Calcul intermédiaire I	x	
	MathQ 303	Calcul intermédiaire II	x	
Physics	PhysQ 241	Mécanique	x	
	PhysQ 243	Les ondes et l'électricité	x	
	PhysQ 301	Aspects quantiques de la physique moderne	x	
	PhysQ 401	Physique nucléaire et particules élémentaires	x	

* University of Alberta. Office of the Registrar. 1988. **1988/89 Calendar**. Edited by the Office of the Registrar. Edmonton : University of Alberta.

